



Magazine

OCTOBER 1961



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FRONT COVER: "A Memory of Summer." Photo by Neil Nimmo, reproduced from an Ilfacolor print



POINT of VIEW

SCIENCE IS STILL INTERNATIONAL

By Trevor Williams
Editor of "Endeavour"

LAST month the Chairman and Directors invited members of the Executive Board and the Bureau of the International Council of Scientific Unions to a reception at IC House. The occasion was the meeting of the ninth General Assembly of ICSU in London, under the auspices of the Royal Society.

THE combination of interests was a particularly appropriate one. On the one hand, the Company's activities depend very much on the application of science, and in recent years its overseas interests have grown rapidly; on the other, ICSU's function is to foster international co-operation in science.

Traditionally, science knows no frontiers. Although this ideal can unfortunately no longer be fully realised, there are many fields in which progress is the result of close and friendly co-operation between scientific workers in many parts of the world. One such project, familiar to us all, was the International Geophysical Year of 1957-58, in which sixty-seven countries took part. More than 2000 observing stations, 57 of them in the Antarctic, were established, and the results will eventually fill 50 volumes. The IGY, by far the largest scheme of worldwide co-operation in science that

has ever been carried out, was initiated by a special committee of ICSU. At the present moment the council is organising, among other projects, a world magnetic survey for 1964-66 and a detailed survey of the Indian Ocean in 1962-63; in the last, at least 20 survey vessels, provided by 10 nations, will take part.

Although schemes of this magnitude can only very occasionally be undertaken, ICSU has over the years organised many less spectacular, but nevertheless very important, co-operative efforts in science; its work deserves to be better known and appreciated.

Another example of ICSU's work, unobtrusive but essential, is in ensuring that the results of recent research are quickly known throughout the world. At the present time the results of scientific work are published in literally thousands of different journals, written in all the principal languages of the world.

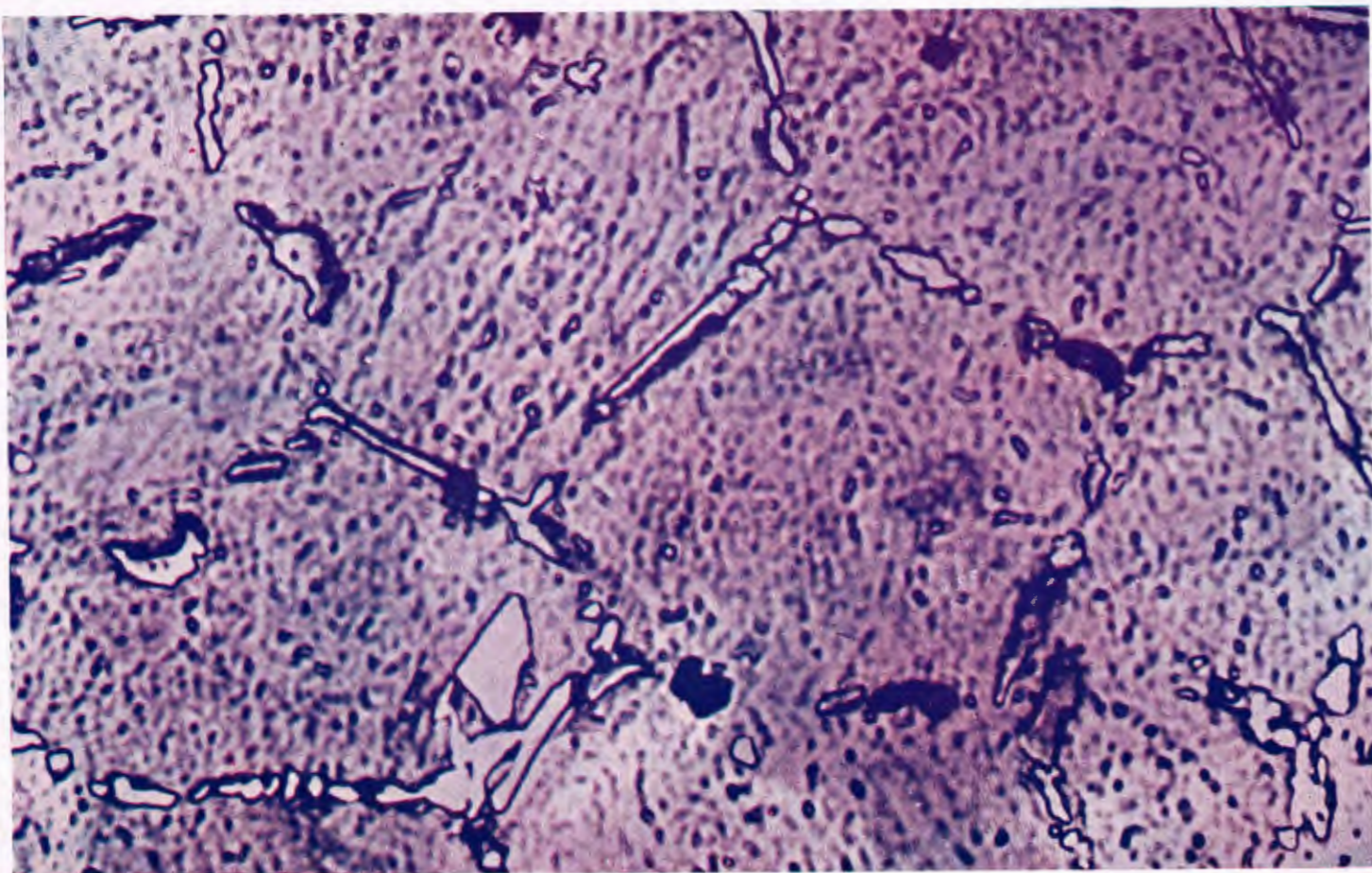
NO individual scientist, even in very specialised fields, can hope unaided to keep track of all that may be important to him—especially as a vital clue may come from a field seemingly remote from his own—yet he must try to do so if he is to take quick advantage of the work of others and avoid duplication. But his task is made much easier

if he regularly receives short summaries, or abstracts, of articles on his own subject; from these he can quickly get a very good idea of what he ought to read in full. ICSU already plays an important role in co-ordinating abstracts in physics and chemistry, and is now turning its attention to biology.

Although it has seen many changes, and its work has twice been interrupted by war, the history of ICSU goes back to the end of the last century.

TODAY it has divisions concerned with international co-operation in all the principal branches of modern science—from biochemistry to astronomy, from biology to radio-science. It also has several special committees, including one concerned with space research. Forty-eight countries are represented, and the organisation has a permanent secretariat at The Hague, under the auspices of the Dutch Ministry of Education, Arts and Sciences. It meets triennially in General Assembly; in the intervals the executive board and the Bureau carry on its business. The recent meeting in London was a welcome reminder in these troubled times that in some fields, at least, friendly co-operation is possible even between countries whose political differences seem irreconcilable.

The opinions expressed in this article are not necessarily those of the Company



ABOVE: Early uranium rod magnified 600 times

BELOW: Welding a large vessel for the UK Atomic Energy Authority at Marston Excelsior's Wolverhampton factory



DE-CLASSIFIED
T.A.P. SECRET

ICI and the Nuclear Age

Contributed by Metals Division

Behind the scenes ICI has made a considerable contribution to the Nuclear Age. One advance after another has been fostered by ICI research and development in which the new metals produced by Metals Division have played a major part.

At a time when attention is focused on the vast reaches of outer space it is salutary to recall the infinitely small but no less spectacular world of the atom.

Metals Division was introduced to it just over twenty years ago. By then, physicists and mathematicians had learned, at least in theory, many of its secrets: they knew that it offered mankind a new and tremendous source of power. But they also realised the immense problems involved in releasing and controlling that power and, still more so, of carrying out such unique technical exercises on an industrial scale. It was at this stage that ICI and other large firms were called in to help the scientists.

For many months afterwards some of the best brains in Metals Division were concentrated entirely on holes—holes of almost unbelievably small dimensions. It came about this way. One of the problems then perplexing the scientists concerned the preparation of nuclear explosives. They knew that uranium atoms came in two sizes and that only the lighter ones (those of the much-publicised U235 isotope) lent themselves to the fission process, so they wanted to find some means of separating these comparatively rare fissile atoms from the less useful mass. The method then being investigated involved sieving a gaseous compound of uranium through holes so minute that only the smaller atoms would have an easy passage. By repeating this process many times they would gradually filter off all the heavier atoms, leaving concentrated U235.

In practical terms, the job handed to Metals Division early in 1941 was to produce sheets of metal containing no fewer than 160,000 holes to the square inch. The fact that this and still more fantastic demands were eventually met is a tribute to unselfish teamwork and much patient slogging. It is, however, no longer a secret that the first breakthrough sprang from an ingenious idea of the Research Manager, Mr. S. S. Smith, fostered by Mr. M. J. S. Clapham, then manager of The Kynoch Press.

Travelling to work one morning, Mr. Smith caught sight of a poster which included a photograph. This had been so enlarged that the tiny dots which are normally almost invisible in a half-tone illustration were comparatively huge. How, Mr.

Smith wondered, did the original minute dots get there? Was this a possible way of marking out holes for isotope separation barriers? The man who could answer at least the first question he found "plane spotting" on the highest point of the factory. When he came back to earth, Mr. Clapham explained how a half-tone block was made and discussed with his colleague the chances of using this process to produce perforated copper foil with 400 holes to the linear inch. He followed up the idea, and shortly afterwards the Sun Engraving Company produced the first rudimentary specimen.

It was not accurate enough for the job it had to do, nor was that made by an alternative printing process, but at least a start had been made—just in time for a series of revised specifications calling for smaller and still smaller holes. Before the target disappeared altogether, technical advances demanded an entirely new concept—porous metal. Eventually the Metals Division team evolved (just how is still a closely guarded secret) a type which could be produced in very large sheets, and millions of square feet of this were supplied for the diffusion plant at Capenhurst.

Another unit of the Division, Marston Excelsior Ltd., collaborated with the British nuclear energy team in devising methods of assembling and mounting these sheets, technically known as diffusion membranes—a task which made unprecedented demands on their fabricating skills and jointing techniques.*

The story of the diffusion membrane has been told in some detail because it emphasises two sharp lessons then brought home to the Division. The first was that nuclear engineering would make demands of hitherto unimaginable stringency on the metallurgist and metal manufacturer; the second that these

* Development of the membrane involved collaboration with Billingham Division, who did a good deal of experimental and theoretical work on the diffusion process, and with General Chemicals Division, who developed techniques for the production of the chemicals required, in particular fluorine—an element so reactive that it had been regarded previously as almost completely intractable. Fluorine, or the more easily transportable compound chlorine trifluoride, was, and still is, used to make uranium hexafluoride and to "pickle" the membranes to preserve them from destruction during the diffusion process.



demands would change rapidly as technology advanced. We shall see how these uncomfortable realities dogged the Division in the years to come.

The first work on uranium and its compounds was aimed at providing the considerable quantities of U₂₃₅ needed to initiate a nuclear explosion. Later, attention was turned to making metallic uranium for power-producing reactors. We have seen how Metals Division helped to solve one of the basic problems of the military exercise; its contributions to the peaceful uses of atomic energy, equally valuable, have been much longer-termed.

It was ICI General Chemicals Division which, in 1942, evolved techniques for producing this difficult, toxic and radioactive metal in massive form and for making the chemicals required. Casting techniques were investigated by General Chemicals Division, while Metals Division attempted the difficult task of developing an extrusion process. The process eventually adopted was a vacuum casting technique, and metal made by it was used to charge the first Harwell piles.

The technical information obtained during this work, to which ICI made important contributions, exercised a profound influence on the future of nuclear engineering. It filled large gaps in the existing sketchy knowledge of the metal's properties and, in particular, indicated how solid uranium might behave when in service in a nuclear reactor. Certainly it provides some nasty shocks for the reactor designers and metallurgists, who came to realise that, because of its poor corrosion resistance,

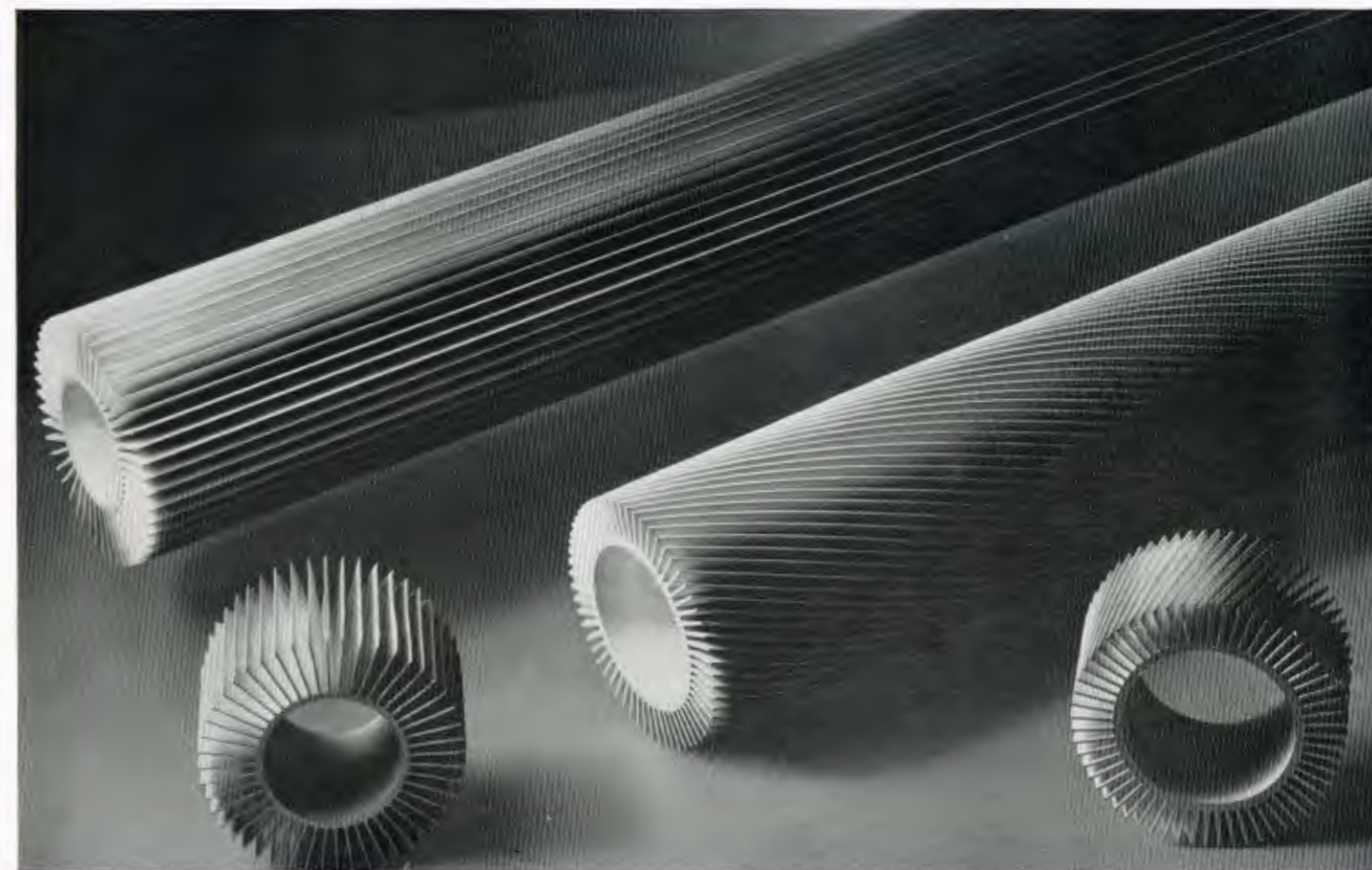
the uranium would have to be contained in a close-fitting sheath of another metal.

A characteristic footnote to this chapter of our story is that the extrusion process, which had provided material for these essential tests, had later to be abandoned in favour of other techniques.

Next to the nuclear fuel, the most important component in a reactor is the metal "can" which sheaths the fuel. In theory, it should be a simple matter to produce a short metal tube and to seal the ends when a rod of uranium fuel has been inserted in it. In practice, the design and manufacture of fuel cans has proved one of the most exacting—and most perennial—of nuclear engineering problems.

To begin with, the choice of canning metal is very limited. It must have a high degree of compatibility with uranium, of resistance to attack by gas, water or other cooling medium, and of "transparency" to neutrons. The can itself must be strong, yet thin enough to avoid interference with heat transfer and ductile enough to tolerate the distortion that occurs when uranium is heated. Perhaps most important of all, the joints which seal the can must be above reproach if the reactor is to function safely.

In 1943, when Metals Division was asked to produce prototype aluminium cans no one knew for certain what coolants would be used, how the fuel elements would fit into the reactor, or how any likely sheathing material would behave in contact with uranium. So it is not surprising that some of the early



OPPOSITE: Corrosion measurement apparatus for nuclear engineering, recently exhibited by the Research Department of Metals Division

ABOVE: Atomic fuel sheathing in special aluminium alloys and magnesium alloys—a remarkable example of precision engineering



experimental work was, by today's standards, somewhat naive. (Members of the research staff still recall curious underwater exercises involving spring mattresses and innumerable tennis balls.) Gradually, however, requirements became more specific and production methods less informal. The only snag was that, as always, new designs and processing techniques were called for at alarmingly short intervals. Simple cylindrical cans gave way to more complex aluminium tubes with a brazed-on secondary surface; these to a still-widening range of integrally finned tubes in new materials. At every stage Metals Division has played a large part in the development and production programme, its work on special extrusion and finning techniques being particularly valuable. Moreover, it was responsible for important pioneer work on end-sealing.

Frequent changes in design would have been trying enough even if a single metal had been used throughout. Inevitably, however, every advance in reactor technology has entailed a re-appraisal of the canning material. The aluminium used for the first cans, though admirable in many ways, will not stand up to the higher temperatures used in later types of gas-cooled reactors; it is not suitable for high-performance reactors cooled by water or liquid metals.

Special Alloys

The answer to some of these problems lay in the development of special aluminium or magnesium alloys, still used by Metals Division for large quantities of finned cans. The remainder could only be solved by turning to metals never before used outside the laboratory.

Two things combined to facilitate the Division's work in this field—its already long association with nuclear engineering and its practical experience with titanium, the first "new" metal to achieve commercial status. When large quantities of wrought zirconium were called for, the Division was able to make these available by adapting processes devised for titanium. It is now making not only fuel sheathing but a wide range of other special reactor components in zirconium and zirconium alloys.

The Division has since come to know still more exotic metals—the hafnium which is used for control rods because, unlike its sister metal zirconium, it readily absorbs neutrons; the niobium and vanadium needed for fuel sheathing in liquid-metal-cooled fast reactors; and the beryllium required for more advanced types of gas-cooled reactor. Perhaps the most intransigent of all structural metals, beryllium is not amenable to processing techniques used for zirconium. To produce it, Metals Division had to build a separate factory—the first of its kind in Europe—and to establish processes and working conditions never before encountered in the metal industry.

Yet another interesting sheathing material is an "old" metal, aluminium, in an unusual form. Known as SAP, this is in effect powdered aluminium having an oxide coating and converted into massive metal by sintering—in other words, the powder is compacted under pressure and "cooked" to consolidate the bonding. Surprisingly, perhaps, this material can be processed to a high degree of dimensional accuracy. The Division has done a great deal of important pioneer work on this aspect of development and is now tooling up for the changeover from research-scale to production-scale manufacture.

OPPOSITE: The first rod of uranium ever to be extruded in the United Kingdom was produced in 1942 on this extrusion press

All the Division's work on nuclear metals has originated in its Research Department. Long before any production department became involved, research staff were busy investigating the properties and behaviour of each new metal and working out, initially on a laboratory scale, the techniques needed to convert raw metal into wrought forms. And their work does not end when a metal achieves full-scale production. The specifications for nuclear metals are formidable in the extreme. Only a research organisation, and an unusually well equipped one at that, could undertake some of the meticulous analysis and tests required—such as checking that certain impurities in zirconium do not exceed one part in two million.

Then, too, Research Department has carried out many hundreds of tests and investigations for the Atomic Energy Authority, involving not only non-ferrous metals but also uranium and other nuclear fuels, steels and ceramics. This emphasises a point about nuclear engineering which is sometimes overlooked—the way in which it infiltrates into almost all the highways and byways of the metal world, even those which are already well explored.

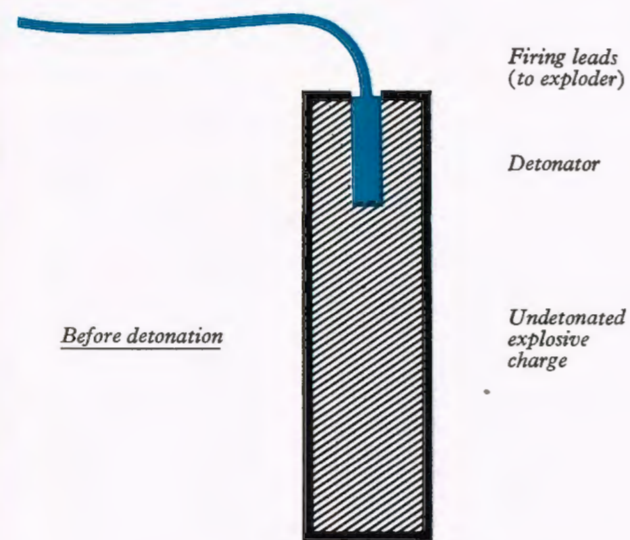
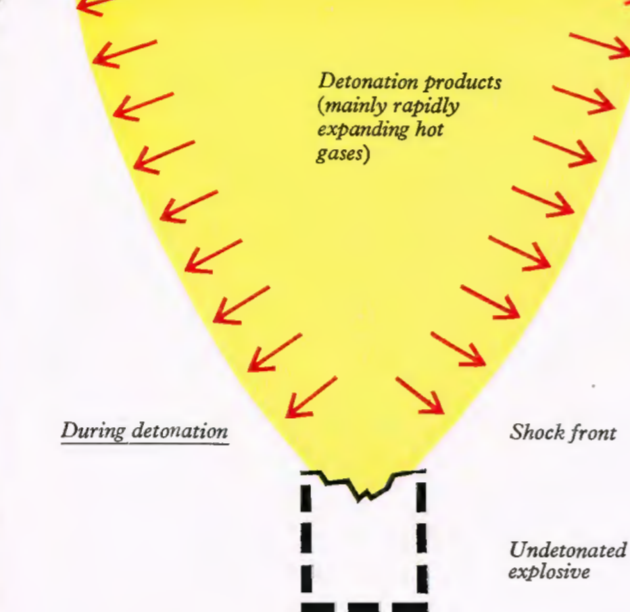
This comes about in two ways. First, even in the new-world setting of a nuclear power station, there is room for familiar materials fulfilling quite normal functions. A good example is provided by the products of Yorkshire Imperial Metals Ltd. In a nuclear power station it is only the method of generating heat which is unusual; the turbine which converts this into usable electricity and the heat exchange plant are quite conventional. The latter absorbs vast quantities of tubes and plates for both main and dump condensers. Calder Hall alone uses 228 tons of YIM condenser tubes and 142 tons of condenser plates.

Traditional Materials

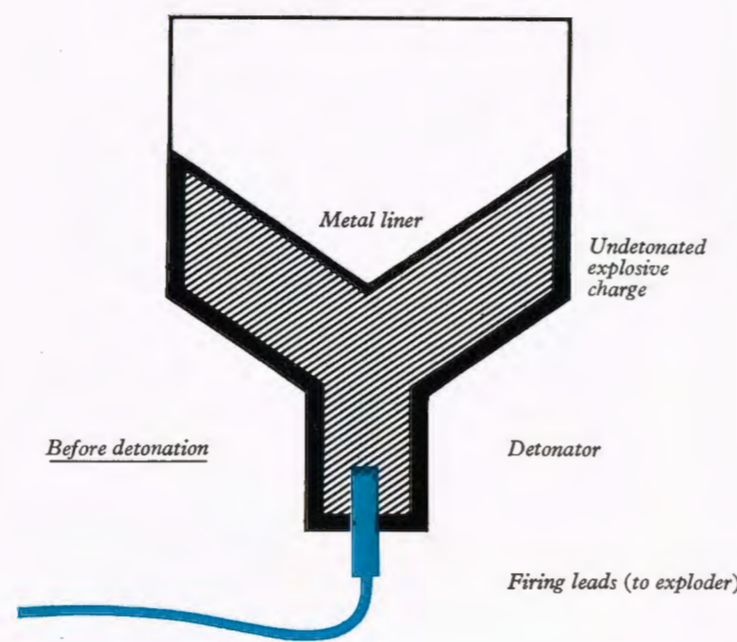
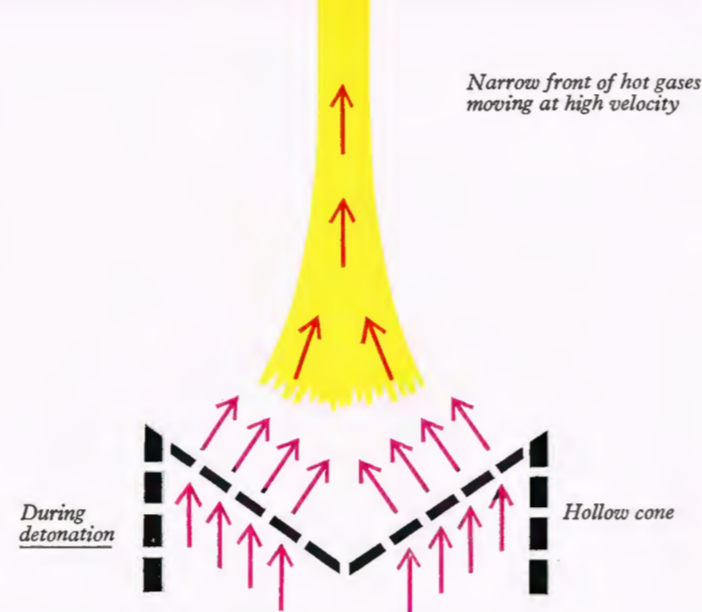
Apart from this, there are countless instances of traditional materials or established techniques being adapted to meet new requirements. One example was the way in which Metals Division utilised its know-how on non-ferrous finned tubing to produce steel 'Integron' for the heat exchangers of Berkeley and Bradwell power stations. Long before the first nuclear power station was designed, Metals Division was producing extended surface tubing in copper and brass by a special extrusion process in which the fins were actually rolled out of the wall of the tube. This integrally finned tubing was exactly what is needed for the heat exchangers of nuclear power stations, but for various technical and economic reasons the material required was mild steel. This harder material was naturally less amenable to the extrusion process, and considerable development work was needed before Metals Division perfected the new techniques.

Most impressive of all, perhaps, has been the effect of nuclear engineering on the traditional work of Marston Excelsior Ltd. We have already seen that they were called in to help with the assembly of diffusion membranes. This was because Marston expertise in welding, brazing and other jointing techniques was already widely acknowledged. So firmly did they underline this reputation that their nuclear engineering commitments have grown in number and complexity ever since. They are among the very few industrial firms to have worked on fuel element assembly; their tube bundles, heat exchangers, fabricated pipework, tanks and vessels carry an enormous burden of responsibility in

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1. Normal cartridge explosive



2. Shaped explosive charge



An early use of the shaped explosive charge—a lace pattern and the coat of arms of the Nobel Explosives Company (forerunner of Nobel Division) imprinted on a metal surface. This use has remained a laboratory curiosity and was never exploited commercially



Shaped explosives

By H. Thomas

The ingenuity of the scientist has developed a means of focusing the shock waves of an explosion and thereby concentrating its effect. A famous wartime result was the PIAT anti-tank gun. The same basic technique is today used for piercing oil well casings, for lifting submarine cables to effect repairs, and for tapping blast furnaces

Like his kin in other domains, the explosives expert is intrigued by the more unusual applications of his skill; and one of these is the shaped explosive charge. The essentials of this technique are not novel—indeed, the basic principles were described by Monroe in the United States and Neumann in Germany at the turn of the century.

The distinguishing feature of the shaped charge is that it comprises a metal cone backed by an explosive. The metal cone has the effect of focusing the shock waves of the explosion into a narrow high-speed jet. This concentrated energy is more powerful than the initial shock wave generated on detonation of the explosive, a phenomenon (capable of mathematical explanation) still sometimes referred to as the Neumann or Monroe effect. The jet so formed may move forward in some cases as fast as 20,000 feet per second.

It is now many years since shaped explosive charges first did interesting things. One of the earliest was to imprint on a metal surface the pattern of a piece of lace. This was done by placing the piece of lace between the metal surface and a shaped explosive charge. The same technique has been used to emboss a trade mark on to a brass plate. Unfortunately this type of application has not proved commercially attractive.

During the war, however, shaped explosive charges came into their own. Their powerful directional explosive effect was used in the design of military weapons for armour piercing—the PIAT and the bazooka—and for static demolition work.

In the construction of the cone the material and shape of its metal liner play an important part. Copper and steel are the most suitable metals for making cones. The metal liner collapses into a slug when the charge is detonated and

moves forward at about 2000 ft./sec. as compared with the velocity of 20,000 ft./sec. achieved by the hot gases in the jet. When the slug hits the target a crater roughly cylindrical in shape will be formed.

For armour piercing the design of the shaped charge is further elaborated. The shaped charge itself is fired at its target, and the impact of the front of the hollow liner with the target actuates a fuse mechanism which in turn results in detonation of the explosive charge. The explosion of the shaped charge perforates the target and sets fire to any combustible material.

After the war, attention was again given to industrial applications. Shaped explosive charges have been used extensively in the last decade for piercing oil well casings—probably their major industrial use today. The oil well casing comprises a relatively narrow diameter well sunk into the oil-bearing strata. Shaped explosive charges are lowered into the well and positioned so that on detonation radial horizontal holes are pierced through the metal casing and surrounding strata. Oil seeps into the well through the holes so formed.

Another outlet has been for the repair of submarine cables. Here the big gain has been to reduce the amount of slack that must be laid in order to allow the cable to be raised for repair. By means of shaped explosive charges the cable can be cut under water and then lifted out of the water for repair. Less cable is therefore needed for a given job, which means a substantial saving in cost.

More recently shaped explosive charges have been specially designed for tapping open hearth furnaces. Time is saved and the job is under better control, so much so that one large open hearth furnace in this country is now tapped by shaped explosive charges on a routine basis.

TITANIUM—the tide turns

By Peter Hodgkinson

In the world of metals, titanium is something of an infant prodigy and, like its human counterparts, it has suffered from the over-exuberant publicity which greeted its first appearance. Six years ago, when ICI launched titanium into the commercial market, newspapers and technical journals quickly dubbed it the "wonder metal" and vied with each other in calculating the astronomical quantities which would be used for everything from motor cars to domestic pots and pans.

Neither ICI nor any other manufacturer has ever made such extravagant claims for titanium. Knowing the unusual and costly processes involved in its manufacture, they recognised that it would always be more expensive than traditional metals, and that its use would be confined to situations where technical advantages would justify a higher initial cost.

The progress of titanium must then be assessed in its proper perspective, i.e., in the light of the sober forecasts of the manufacturers rather than the wild prophecies of less-informed journalists.

An Early Reverse

Titanium was developed to meet the needs of the aircraft industry for a light, strong metal which would withstand higher temperatures than more conventional light alloys. Because of its high price, the natural assumption was that it would be used first in military aircraft, and all early forecasts of consumption were based on the Government's building programme. So the shock received by the infant titanium industry in 1957, when the Government drastically reduced this programme, might well have proved fatal, particularly to ICI, who had plans for increasing its melting capacity from 1500 to 2000 tons a year and for establishing a separate factory to manufacture wrought forms.

What saved the day was that ICI had never relaxed its research effort on titanium. By this time the metallurgists knew enough about its properties, and its alloying potentialities, to be confident that it would become indispensable to the aircraft industry, civil as well as military. Moreover, they had come to realise that some of its properties could take titanium right outside the aircraft industry and into the much wider field of chemical engineering. The big hurdle here was price. The chemical industry had no benevolent Ministry to support development work and long-term trials: any new material offered, however glittering its promise, had to make its way in the hard world of commercial economics.

In short, it was recognised that acceptance of titanium as a structural metal, though inevitable, would be slower than at first hoped. Instead, however, of marking time, Metals Division adopted a policy of aggression on two fronts. Technically, their

ICI's titanium, the new metal that withstands great heat and corrosive attack, ran into a sticky patch when rockets replaced aircraft in Britain's defence plans. However, a big research endeavour into new uses, allied with lower prices as production rose, finally paid off.

Titanium now stands on its own feet as a sound commercial proposition.

objective was so to improve processing techniques that the selling price could be reduced in advance of developing demand. Commercially, they undertook a forceful development and sales campaign, aimed at establishing that titanium could open up entirely new concepts of chemical engineering. The ultimate goal was to develop demand to the point when increased throughput would itself make possible progressive price reductions.

Pattern of Progress

Since 1954, the selling price of wrought titanium has been reduced five times. The last reduction, in November 1960, brought the price of all but the most specialised wrought forms down to well below half the 1954 level. For instance, titanium rod today costs about 56s. per lb., compared with over £6 per lb. in 1954; strip has been reduced even more dramatically—from over £8 per lb. to about 70s. per lb. This has not come about because of some fundamental change in processing techniques (as happened when the advent of hydro-electric power radically transformed the production of aluminium). It is the result of painstaking technical effort to "shave" inherently heavy production costs, aided more recently by a welcome increase in throughput.

Even so, titanium is still much more expensive than competitive structural metals—10–15 times the price of stainless steel, 20 times (volume for volume) that of commonly-used aluminium alloys. Titanium, then, is anything but a "soft sell." Before they will invest in it, potential customers must be convinced that the outlay is justified—and convinced not by research data but by extended trials in service conditions. The aircraft industry, in the hands of large manufacturing groups, is well equipped to undertake such tests and to develop the fabricating techniques best suited to its specialised needs. Comparable facilities are rare in the broad ramifications of the chemical and allied industries: here engineers are generally interested only in finished components. So not only they but the equipment manufacturers have to be persuaded that a more expensive material may be justified, and even then the ultimate user will want to try out titanium equipment for himself on a modest scale.

The demand for titanium is building up according to the pattern suggested by these facts—slowly but steadily in the aircraft industry, in more obvious steps as branches of the chemical industry become satisfied with the results of service trials.

Titanium for Aircraft

All the major British aircraft companies now accept titanium as a normal material of construction. Commercially pure titanium, because of its light weight coupled with ability to



The Avro Vulcan B2, a long-range bomber with maximum speed of over 600 m.p.h., makes considerable use of ICI titanium

withstand moderate temperatures for long periods or high temperatures for short periods, is an established material for heat-resisting applications such as fireproof bulkheads and exhaust shrouds. Resistance to attack by sea water, fuels, hydraulic fluids and solvents makes it suitable for storage tanks, control systems and other applications where immunity to corrosion is important. Higher-strength titanium alloys are used in stressed applications such as compressor blades, discs, casings and by-pass ducts, engine rings, forgings, bolts and other fasteners.

The present position is that titanium is going into less aircraft than was originally expected, but more and more titanium is going into each aircraft. This trend will certainly continue, particularly as ICI makes available new titanium alloys developed to meet specific requirements of aircraft designers. The only foreseeable chance of a sudden dramatic rise in consumption lies in the possibility of supersonic airliners replacing the present generation of subsonic passenger aircraft. Then, because of the higher operating temperatures involved, titanium may well be used in much greater quantities for airframes.

Titanium for Chemical Plant

The progress of titanium as a corrosion-resistant material for chemical plant is most clearly seen in Metals Division's rapidly expanding range of technical literature. In 1957, a 4-page leaflet drew attention to the potentialities of this new material; a few photographs showed specially-made prototypes of somewhat undemanding character.

Four years later, Metals Division offers a whole series of generously illustrated and soundly documented leaflets under the general title "ICI Titanium for Chemical Plant." Some of these deal with widely-used components, such as compressor valve plates, heating coils and anodising jigs, for which the use of titanium can be abundantly justified on both technical and economic grounds. The latest describes a particularly successful application in the hot dip galvanising trade where, because of their long life and other technical advantages, titanium carriers are not only more efficient but vastly more economical than their "cheaper" steel counterparts. Then there are the leaflets designed to show all the ways in which titanium can be employed by particular sections of the chemical engineering industry, e.g., textile and paper pulp bleaching. Here, because of its resistance to the highly aggressive liquors and gases encountered in bleaching processes, titanium is used for a wide variety of components from nuts and bolts to large filter units, as well as for lining still larger items of plant made in steel.

The latest issue of the general leaflet on titanium for chemical plant shows such diverse applications as trunking, pump

impellers, valves, strainer baskets, storage tanks, distillation columns and reaction vessels. Two items of particular importance are chemical pumps and heat exchangers of various types, where titanium is proving the answer to longstanding corrosion problems in many branches of industry.

Titanium, then, has already obtained a firm foothold in the chemical industry—so much so that these outlets now account for a significant proportion of ICI titanium sales. Even more important, titanium is beginning to move out of the experimental stage. Customers who have been conducting long-term trials with single units are sufficiently convinced of its merits to start specifying titanium for complete production lines. It seems reasonable to hope, therefore, that the next year or so will see a marked increase in consumption, not only in the UK but elsewhere in Europe, where an intensive sales campaign has recently been instituted.

In approaching these overseas markets, ICI titanium sales representatives have two advantages. They can demonstrate a development effort far ahead of that achieved by titanium producers in other countries, even in the US, which was first in the field with titanium for aircraft. And, having access to the fabricating skills of Marston Excelsior Ltd. and other experienced British manufacturers, they can offer "ready-made" titanium equipment as well as non-standard items made to individual specifications.

Future Prospects

In considering how far ICI's policy on titanium has been successful, we should remember that it is commercially a very young metal. It is only seven years since the first samples of ICI wrought titanium left the Witton factory; only four since a Government White Paper dashed reasonable hopes of a large and quickly-developing market. No one could expect to bring about in that time the fundamental change of approach to design engineering which alone will fully utilise the technical advantages of titanium. Moreover, titanium producers themselves still have much to learn about this remarkably versatile metal, on which an extensive research and development effort is still concentrated. They are, for instance, devoting attention to small but expanding markets for titanium in fields as diverse as nuclear engineering and the manufacture of surgical implants and prostheses.

Taking these factors into consideration, Metals Division has grounds for modest satisfaction with progress made so far. Nothing has happened to shake its faith in the promising future of this metal as an important material of construction in a broad range of industries and as a profitable manufacturing investment for ICI.

THE AIRCRAFT INDUSTRY

Last year ICI sold to the aircraft industry goods to the value of nearly £5 million. Where were they used? Artist Hugh Chevins visited our customers to find out.

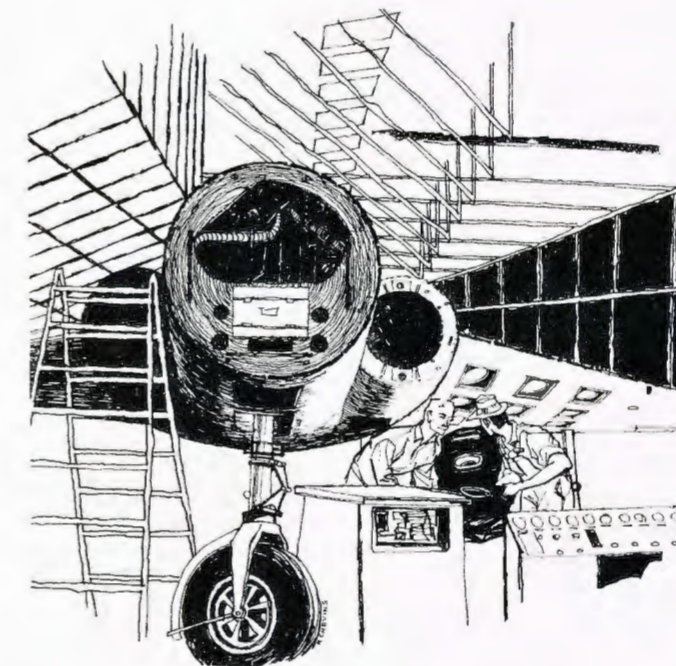
It may soon be technically possible to transport a mailbag by rocket to Australia from the British Isles in an hour or so. And it is still less than 60 years since Orville Wright made the first controlled sustained flight in a powered aeroplane (he flew 120 ft.).

The first aircraft manufacturing company in the world was a British firm, Short Brothers, who received a contract for the construction of the six Wright biplanes in 1908. The first UK company formed exclusively to manufacture aeroplanes was founded by Handley Page in 1909, and in 1910 the British and Colonial Aircraft Co., now the Bristol Aircraft Co., became the first firm to embark on large-scale production and to invest large sums of money in aircraft manufacture. About the same time men like Sopwith, Roe, Blackburn and de Havilland entered the new industry and Rolls-Royce began to make aero engines.

The ups and downs of the aircraft industry in the years which followed make fascinating reading. The production lines of at least one firm were kept busy in the doldrums of the 1920s making toys, bassinets, and even billiard tables.

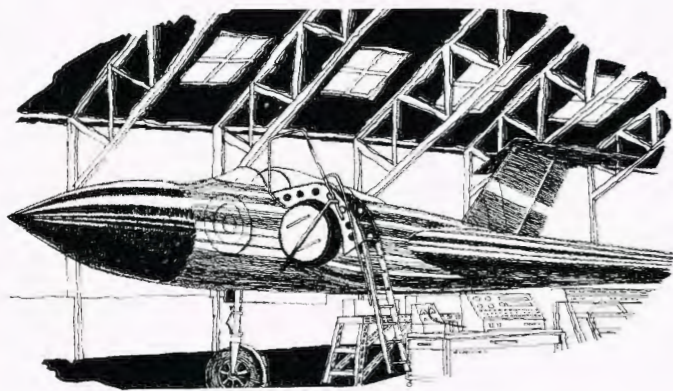
Today the British aircraft industry employs over a quarter of a million people and has a net annual output of about £250 million. It is a valuable exporter—aircraft and spare parts account for about 10% of Britain's engineering exports.

The industry is a valuable customer for ICI goods. Direct sales alone amount to between £4 and £5 million a year. The principal products we sell are titanium from Metals Division; plastic radomes, heat exchangers and flexible fuel tanks from Marston Excelsior; trichloroethylene from General Chemicals Division; 'Perspex' from

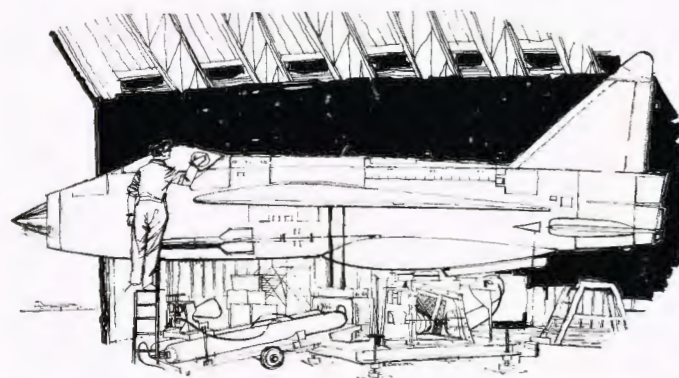


ABOVE: A flexible fuel tank, made by Marston Excelsior Ltd. of Metals Division, being fitted to the Gloster Javelin, a two-seat, all-weather fighter which has a delta wing and tailplane configuration. It can fly at speeds in excess of mach 1.0 and is the keystone of Fighter Command's day and night defence system

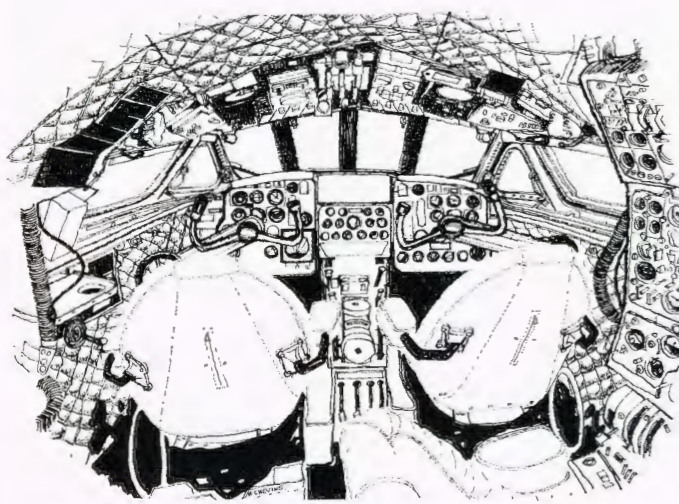
OPPOSITE: ICI finishes are firmly specified for the exterior painting of BOAC's Comet 4 fleet. For many years BOAC have used a basic painting process incorporating surface pretreatment with ICI 'Deoxidine' 202 followed by etching primer and 'Du-lite' white topping on the upper fuselage areas of the Comet—the white topping assists cabin cooling when the aircraft are standing down in hot climates. 'Dulux' enamels in BOAC livery colours of royal blue, pale gold and red together with 'Dulux' ground-coats are used for the cheat line, insignias and emergency markings. Our illustration shows an operator applying 'Dulux' royal blue on canopy areas in the vicinity of cabin windows



The plastic radome and heat exchangers for the Gloster Javelin are also supplied by Marston Excelsior. Equipped with a great array of radar search gear and armed with four Firestreak guided missiles, it can locate and destroy hostile targets in any weather conditions. Several variants of the Javelin are in squadron service with the RAF at home and abroad. The sketch shows a Javelin being prepared for flight test



The windscreens of high speed aircraft are treated with a special silicone fluid to give a tightly bonded, microscopically thin water-repellent film. Silicones are used where conventional windscreen wipers cannot operate because of the speeds involved. Unfortunately the two cannot be used together, and silicones are not suitable for use on car windscreens



The cockpit of a Comet 4C, the latest variant of the de Havilland Comet, showing the use of ICI materials, in particular 'Perspex,' quilted 'Vynide' for lining the roof, and the plastic insulation of electrical wiring. The Comet jet airliner has been de Havilland's main civil project since the war. The Comet 1 was first flown in 1949 and came into service with BOAC in 1952. The Comet 4 opened the world's first jet airliner service across the North Atlantic on 4th October 1958

Plastics Division; and protective finishes from Paints Division.

Let us take titanium first. This is used for compressor blades in gas turbines in both turbo-prop and jet engines, bypass ducts, and some bolts and screws. It is in these cases the combination of lightness with strength which counts. The compressor blade application also involves creep properties and retention of properties at moderately elevated temperatures. Titanium is also well established for heat-resisting applications such as jet shields and flame shrouds to keep the hot gases and flames away from the aluminium body of the aircraft.

'Perspex' for Glazing

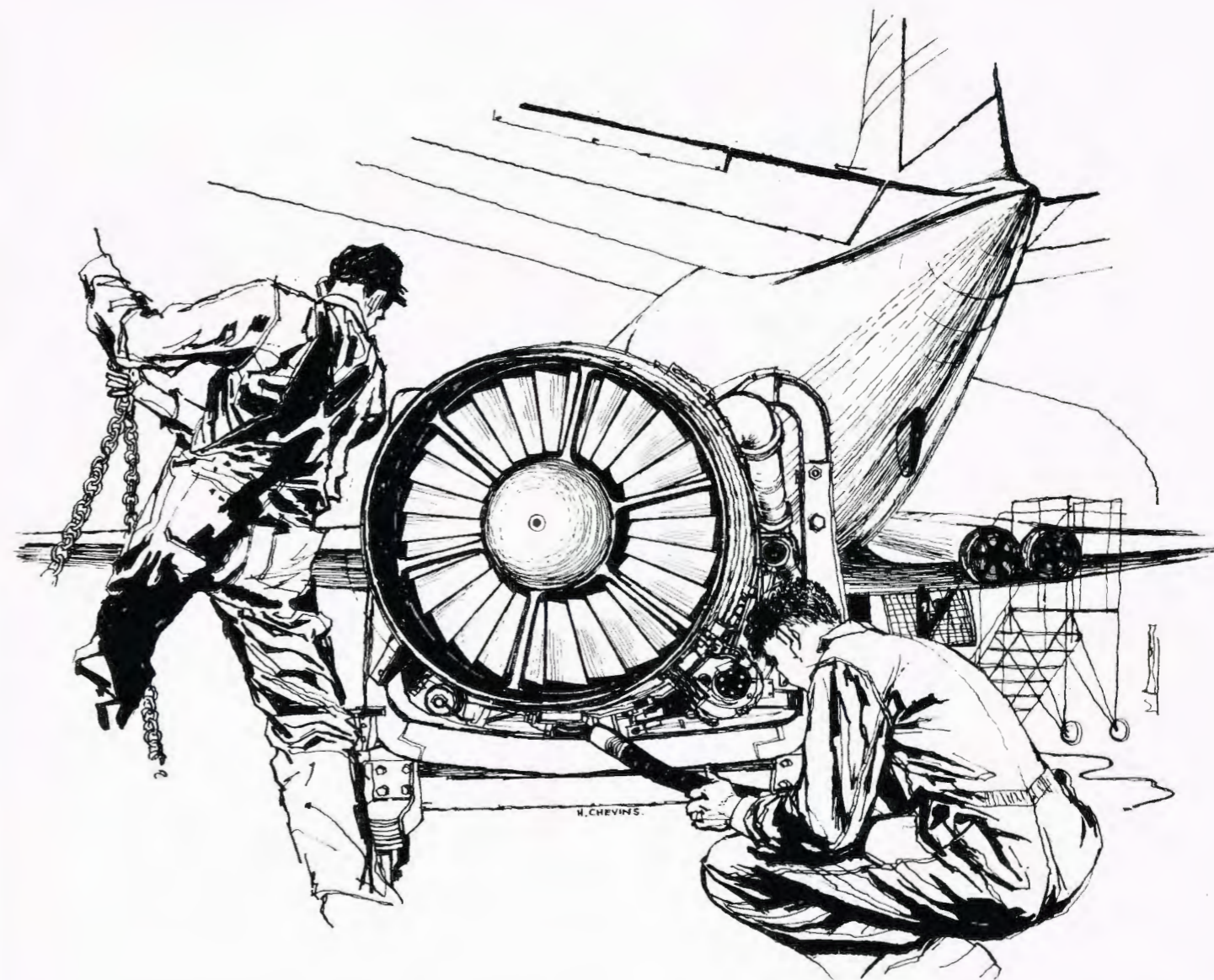
'Perspex' is currently used for glazing all British aircraft, a development which, as most people know, dates from the last war. 'Melinex' film is used to line the floors of certain parts of aircraft—the galley, cocktail bars and washrooms, for example. Its impermeability prevents the more corrosive liquids from reaching the airframe where they might cause damage. 'Fluon' p.t.f.e., the "slippery plastic," is used to impregnate bearings, which thus require no lubrication; in insulation of high-temperature electric cables; in sleeving to reduce frictional loss in mechanical cables; in corrosion resistant seals and in flexible metal-braided hose; and in piston rings, engine valve seals, and electrical, radio and radar components. 'Darvic' rigid p.v.c. sheet is used extensively for interior fitments. 'Alkathene' is used in the insulation of cables for airborne radar. Nylon is used for sheathing insulation in jet aircraft.

Special Protective Finishes

A comprehensive range of surface coatings, including 'Dulux' and special chemical resistant finishes supplied by Paints Division, are widely used by aircraft constructors and principal UK airline operators for the exterior and interior of civil and military aircraft.

Such aircraft as the Valiant, Viscount, Vanguard and VC10 produced by Vickers Armstrongs (Aircraft) Ltd., the Trident and Comet from de Havilland Aircraft Co. Ltd., the Britannia of Bristol Aircraft Ltd. and the Hawker Hunter, in squadron service with air forces of many countries, are examples of the extensive use of ICI painting schemes.

The aircraft industry is one of Marston Excelsior's biggest customers. They make plastic radomes, flexible fuel tanks and heat exchangers for the big airframe concerns like Vickers Armstrongs (Aircraft) Ltd. and de Havilland Aircraft Co. Steatite and Porcelain Products Ltd., another subsidiary within Metals Division, make ceramic components for all manner of electrical, radar and radio equipment. Trichloroethylene is used in large quantities for degreasing purposes, both during fabrication and in maintenance work. Heavy Organic Chemicals Division supply de-icing chemicals which are fed out of the leading



Metals Division's titanium production goes chiefly to the aircraft industry for use either in engines or airframes or both. Our sketch shows mechanics at London Airport working on a Rolls-Royce Avon engine which powers the Comet. Titanium is used for the firewalls of the engine

bays and for the blades in certain of the compressor stages. This engine also powers the Hawker Hunter, the Vickers Valiant, the English Electric Canberra and Lightning, the de Havilland Sea Vixen and the Vickers Supermarine Scimitar

edges of the wings of a plane in flight and are also used on the ground.

At speeds faster than sound conventional windscreen wipers will not function, so Nobel Division sell a special silicone fluid to the RAF for use on its supersonic aircraft to make the windscreen water-repellent. Silicone rubbers are also extensively used because of their unique ability to stand up to the extremes of hot and cold operating conditions which are encountered. The applications include various types of cable, door cowling and window seals, switch covers and starter hoses.

ICI (Hyde) has a big interest in commercial airliners. Large quantities of 'Vynide' are used for decorating the interiors. P.v.c.-coated fabrics like 'Vynide' have the

additional virtue of passing the most stringent fire tests.

What of the future? One avenue being explored by Dystuffs Division is the possible use of rigid polyurethane foams for heat insulation. This Division, of course, also has an indirect interest in the aircraft industry in its sales of chemicals for flexible foams for upholstery and rubber chemicals to the tyre manufacturers.

There are also optimistic predictions of big sales of titanium if present developments in supersonic and vertical take-off (VTOL) aircraft proceed according to plan, and Paints Division, also with an eye to the future, are already in the forefront with new developments relating to painting problems concerned with supersonic flight.

People and events . . .

Polypropylene Yarn Plant Starts Up

FIBRES Division announced last month that they have started production of 'Ulstron'—ICI's brand name for polypropylene filament yarn—on a pilot plant at Wilton Works. The first full-scale plant, with a capacity of 5 million lb. a year, will begin production at Wilton by the end of the year, and extensions will be built as required at the Company's new site at Kilroot in Northern Ireland.

Since August 1960, when ICI obtained from Montecatini of Italy the rights for the manufacture and sale in the UK of polypropylene fibres, Fibres Division have been carrying out development work on polypropylene filament yarns. The first commercial uses of 'Ulstron' high-tenacity multi-filament yarn will be for fish netting, twines and ropes.

Polypropylene is the only man-made fibre available to the fishing industry which combines to such a high degree the important properties of great strength, extreme lightness and negligible water absorption. Furthermore, by special production techniques ICI has succeeded in making 'Ulstron' high-tenacity filament yarn stronger than any other polypropylene yarns currently being produced elsewhere in the world.

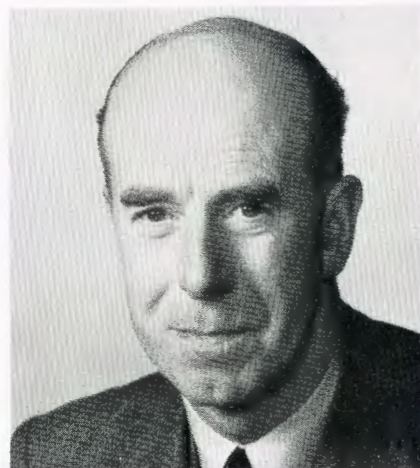
This is the third fibre in which ICI has an active interest. In an article on the prospects for polypropylene contributed by Plastics and Fibres Divisions which appeared in our January issue it was stated: "As a filament yarn it may outdo even nylon and 'Terylene' in industrial uses on account of lower prices (current price 7s. to 8s. a lb.) and great strength, and as a staple fibre it will make soft, bulky 'woollens,' knitted jumpers and cardigans, and jersey fabrics with hard-wearing properties—perhaps not quite as good as 'Terylene'—without 'pilling' as some synthetic fibres tend to. For blankets and carpets polypropylene staple fibre

has the great advantage of springiness, which means that it recovers quickly from crushing."

New Chairman

MR. W. d'Leny, who has been Billingham Division technical managing director since the beginning of 1958, has been appointed chairman of that Division in succession to the late Mr. W. J. V. Ward.

Mr. W. d'Leny joined the Billingham organisation in June 1926 and during the next three years held appointments in the Research and Production Departments. In August 1929 he was appointed deputy research manager of the Nitrogen Division and later in the same year became group manager of the Coal Gas Plant. This marked the beginning of his close associations with one of the major developments in the history of



Mr. d'Leny

the Billingham Division—the successful establishment of a large-scale process for the manufacture of petrol from indigenous coal—and in 1942 he became the Oil Works manager.

In January 1947 Mr. d'Leny joined the Directorate staff for special duties with the Division chairman, and a year later he was appointed to the board of the Company's Central Agricultural Control organisation. He became the Billingham Division research director in November 1951, and in January 1958, following the re-organisation which resulted in the formation of the Heavy Organic Chemicals Division, he was appointed Billingham Division joint managing director (technical).

In March 1960 his responsibilities were further increased when he accepted an invitation to join the boards of Richardson's Fertilisers Ltd. and Ulster Fertilisers Ltd.

Mr. d'Leny was educated at Alleyns School, Dulwich, and St. John's College, Oxford, and lives at Greatham, near West Hartlepool. He and his wife enjoy winter sports holidays, and his other interests include farming and the theatre.

Record Award

AWARDS of another £500 each have been made to two Fibres Division employees for a suggestion which has already brought them £540 between them. The total amount awarded to the two—Mr. Stanley Meaburn, a drawframe operator at 'Terylene' Works, Wilton, and Mr. Donald Bradley, leading hand process operator in the Research Department at Harrogate—has now reached £1540, which is one of the highest amounts ever awarded by ICI for a single suggestion and a record for both Fibres Division and the Wilton Site.

The suggestion which has earned this record amount is for simplifying and speeding up the joining of the end of one bobbin of filament yarn to the beginning of a full bobbin. Mr. Meaburn hit upon the idea of this tail wind-up device while at his job at the drawframe. By a coincidence, while he was working out his idea at Wilton Mr. Bradley was thinking up something on similar lines at Harrogate. The



Mr. Bradley

Mr. Meaburn

current transfer tail device used at Wilton is based on the ideas put forward by the two men.

Neither man has yet made any firm plans as to what he will do with his latest windfall.

Bellringers' "Everest"

IT may be an aged verger or sexton who rings the bells for Sunday service at your local parish church, but youth, health and stamina are all needed by those who take bellringing seriously. Two such enthusiasts are Mr. Barry Hendry, a technical officer in Metals Division's Research Department, and Mr. Derek Ogden, a colourist at Dyestuffs Division's Blackley Works, who recently took part in a marathon exercise at Loughborough Bell Foundry.

On 15th July this year a new record was set up when the longest peal ever rung by eight ringers was achieved by a team drawn from seven counties, whose ages ranged from 18 to 29.

Change-ringing, the type of bellringing peculiar to Britain, began in the sixteenth century. In change ringing the bells are numbered from the lightest or treble to the heaviest or tenor bell. Changes are produced by altering the order in which the bells are rung—and during the peal a sequence is never repeated.

Eight bells give no fewer than

40,320 changes, and in 1761 ringers at Leeds in Kent achieved this marathon in response to a promise from the local squire, who, on being asked to provide two more bells to make their ring of eight into a ring of ten, said they could have the other two bells when they could ring all the changes on eight. They had 14 ringers in the village, and by relieving one another as they tired, they completed the 40,320 changes in 28 hours. A certain James Barham is said "to have stood beneath his bell for fourteen hours before stopping to partake of wine." This personal record of his remained unbroken, as far as anyone knows, until last July.

To ring all 40,320 changes with only eight ringers has long been the bellringers' "Everest." This involves standing up ringing continuously for a whole day, with the added handicap of trying to feed while both hands are controlling a rope which is going up and down some thirty times a minute.

Since 1954 several attempts have been made but all ended in failure at



about the half-way mark, the best attempt being 28,850 changes. At Loughborough last July, although they didn't quite reach the 40,000 mark, they managed to add nearly 10,000 to the record. They rang 37,704 changes without a repeat, taking 15½ hours to do it.

Quite a Nest Egg

THIS month for the first time more than half the employees of ICI will be having stock handed over to them under the Profit-Sharing Scheme. The following statistics produced by

Pensions Department, who administer the scheme, are therefore not without interest. They have taken the case of a payroll worker today who has been in the Scheme from the beginning and who has retained all the stock allotted to him.

Taking the average for payroll workers, such a man will have received 134 units of stock under the Scheme when this month's distribution is completed. Taking a current value for this stock of 65s., the total value of his holding will amount to £436. This sum will give him a yearly dividend of £18 8s. before tax and £11 5s. after tax at the present full standard rate.

These figures exclude the stock issued this year as part of the Rights Issue, as this stock had to be paid for, but do include the stock issued under the bonus issue in 1958.

Such a dividend is hardly an extravagant sum, taken by itself, but it is the equivalent of about an extra week's wages for many employees.

New Look

READERS may have noticed in recent months a new look to some of the articles in the Magazine. This is the work of Mr. Colin Forbes, who has now joined the staff of the Magazine as art editor. By next month the whole of the Magazine will have had a facelift. Meanwhile our October issue is something of a transitional one, with about half of the features in the new style and half as before.

Mr. Forbes is not a complete newcomer to ICI. He is the son of an ICI man—Mr. Forbes senior was a member of Central Publicity Department until his retirement in 1948—and for the past year he has been retained by Plastics Division as art editor of *Plastics Today*. He also tells us that it was largely due to the influence of Mr. J. E. Maunton, head of Publicity Department's studio, that he went as a student to the Central School of Arts and Crafts, where he later became head of the Graphic Design Department.



Mr. Forbes

Now, at 33, he has an international reputation as a designer, and his work has been on view in exhibitions in London, Paris and New York and in all the international design magazines. Recent work has included the design of a number of covers for Penguin Books and both the lettering for and the complete signposting system of the new overseas building at London Airport, due to be opened next month. He is also consultant art director to Pirelli Ltd., the British branch of the famous Italian tyre firm.

Track Triumphs

SUMMER 1961 has been a highly eventful one for a 21-year-old records clerk at Head Office, **Mrs. Madeleine Cobb**. Not only was she married (in June), but she has also made

IN BRIEF

Lord Amory resigns. Lord Amory has resigned from the board of ICI consequent upon his appointment as High Commissioner for the United Kingdom in Canada.

Swimming Gala. Alkali Division were hosts to and competitors of Billingham, Dyestuffs and General Chemicals Divisions for the annual inter-Division swimming gala. The gala, held at Northwich, was won by Dyestuffs Division.

Band "Double." The Deudraeth Silver Band scored a handsome double at the National Eisteddfod at Rhosllanerchrugog, North Wales, when they won the class B section with the test piece Rossini's William Tell Overture and class C with The Princess and the Poet (Ball). Both the village of Penrhyndeudreath and Cookes Explosives factories factory (Nobel Division) had something to celebrate, for of the 21 members of the band 11 are ICI employees.

Suggestion Award. A Suggestion Scheme award totalling £120 has been paid to Mr. Bernard Marwood, an assistant foreman on the Nylon Plant at Hillhouse Factory. His suggestion, submitted before his promotion, makes possible a considerable reduction in the quantity of material needed to clean out the melt kettles used in the nylon spinning units.

Green Keepers' Trophy. Mr. H. Hammond, groundsman at Dyestuffs Division's Huddersfield Works, and his staff have been declared joint winners with the groundsmen of South Marine Gardens, Bridlington, of the Yorkshire Green Keepers' Trophy. This is the fifth occasion on which Mr. Hammond has won the trophy since the war and the seventh occasion altogether.

a very successful return to the athletics track. She is probably better known to athletics enthusiasts among our readers as Madeleine Weston, the girl sprinter who in 1958 won a gold and a bronze medal for England in the Empire Games and a silver medal for Britain in the European Games.

A knee injury kept Madeleine's name out of the news and lost her the chance



Mrs. Cobb

of competing in the Olympic Games last year, but after a hard winter's training—she averages four sessions a week—she has made a splendid come-back this year.

Last month she was picked for the British team for all four international matches (against Germany, Poland, France and Russia). She was, she says, particularly pleased with her performance in the Polish match when she came second to the Polish No. 1 and beat Jennifer Smart, current British women's sprint champion.

Now the season is over, but for Madeleine this merely means the start of another tough training session in preparation for, she hopes, the Empire Games at Perth and the European Games in Belgrade next summer.

Film Award

A 16-MINUTE instructional film entitled *Plating Off a Gas Main*, which was made by the Alkali Division

Information Service, has won an award in a competition for internally produced industrial films, organised by the journal *Industrial Screen*.

The film was made at the request of **Mr. G. R. Barr**, Wallerscote Works manager, and was directed, filmed and edited by **Mr. C. A. Scott**, AIBP, to a script by **Mr. E. C. E. Palmer**, Wallerscote Works safety officer. Mr. Palmer also spoke the commentary, which was recorded by the Division Electrical Investigation Section.

In the same competition *Animal Anaesthesia* made by Billingham Division's Agricultural Film Unit won a certificate of merit.

'Pel' Hands I Love

FOR those of our women readers who, like the writer, tend to lavish oodles of cream on their hands, only to forget to wear rubber gloves when it comes to doing the dishes, a new Pharmaceuticals Division product should prove a great boon.

Called 'Pel,' it is a new and rather special kind of hand cream which does double duty as a barrier cream, and if the small-scale trials carried out in Southampton and York and in the Northern Region's territory are anything to go by, it should have a considerable success.

It comes in a pale blue tube and costs 2s. 7d. By the time this appears in



print it should be on sale at chemists' shops and the toilet counters of some stores throughout the country.

The experts recommend using 'Pel' at least twice a day. Once in the morning before you start work—it acts like an invisible glove, keeping out

stains and grime, detergents and hard water—and then again at night, this time purely to feed and soften the skin.

Polish Prizewinner

A BALLOON released at Fibres Division's children's sports day was found by a Mr. Bronislaw at Gorzow, Poland, which is over 750 miles from Harrogate. He returned the ticket and so won the first prize for Miss Judi Evans, daughter of **Mr. Reg Evans**, an experimental officer in Fibres Division's Research Department.

A letter of thanks was sent to Mr. Bronislaw by the organisers of the



The 'Terylene' tablecloth sent to Poland from Fibres Division

sports in which they asked him to send details of his age, etc., so that a suitable prize could be sent to him. Back came the reply that Mr. Bronislaw was middle-aged, but that he would prefer if possible a gift suitable for his daughter who had recently got married. Consequently the beautifully worked lace tablecloth in 100% 'Terylene' (pictured above) was chosen, and has been despatched to Poland with the best wishes of Fibres Division.

No More Mildew

THE juicy oranges that you see in the shops today probably owe their good looks to a Heavy Organic Chemicals Division product made at Billingham called 'Topane' WS.

'Topane' WS, sold by Plant Protection Ltd. under the trade name

'Sofanate,' is a fungicide used to protect fruit from going mouldy during its journey—often thousands of miles in a ship's hold—from the grower to the shops. Until a few years ago attack by moulds and other fungi caused considerable damage to fruit and vegetables during storage and transport. But since 1958 there has been a big improvement. In that year Government regulations were made permitting the import and sale of many fruits treated with approved preservatives, of which 'Topane' WS is one.

Besides actually dipping fruit in 'Topane' WS solution, another method of protection is to treat the tissue paper wrappings, and for good measure the cartons and boxes the fruit is packed in can be treated too.

And the usefulness of 'Topane' doesn't end there. Because it is easy to handle and non-poisonous, it can be sprayed on the walls and fittings of

places where food is made and stored. Ships' holds, warehouses (particularly refrigerated stores for meat), bakeries, breweries and farm buildings are a few examples.

The same virtues which make 'Topane' valuable as a food preservative have also led to its use as a preservative in many other fields. The intriguingly wide list includes conveyor belts and fishing nets, carpets, timber, leather for shoes, gum for envelopes, and wrapping paper for tablets of soap.

Wilton Youth Trophy

A CONVERSATION which **Mr. Vic Goodsell** (Wilton Works) had with **Field Marshal Viscount Slim** when he attended the last meeting of Central Council has resulted in Lord Slim offering to donate a trophy to the Alexander Fleck Youth Centre.

During their talk, Mr. Goodsell, a

PEOPLE

Peter Wright, a 20-year-old student apprentice at Wilton, was placed fourth in the technical designer section of the International Apprentices Competition at Duisburg, West Germany.

Mr. Donald Silver, a mechanic at Nobel Division's Ardeer Factory, has won this year's shoot for the papingo, the historic archery competition held at Kilwinning. Mr. Silver is a former captain and a member of the club council of the Ancient Society of Kilwinning Archers.

Mr. L. Biggins (Dyestuffs Division) and his wife and elder daughter attended a recent royal garden party at Buckingham Palace, where they were presented to Princess Alexandra. Mr. Biggins is Mayor of Middleton and on 1st August was made a Justice of the Peace for the Duchy of Lancaster.

Three players from the Wilton junior football side were picked to play in the North Riding County trial match played under floodlights at the Billingham Stadium on 21st September. They were the juniors' top goal scorer **John Gill**, vice-captain **Mick Baldock** and captain **Ray Speed**.

Four members of the athletic section, **Robert Armstrong**, **Hugh Bryden**, **Barclay Kennedy** and **Joe McGeough**, made Ardeer Recreation Club history last month by winning the Ayrshire mile medley championship for men. Their victory was witnessed by a large crowd in

Irvine, where the race was staged as part of the Marymass celebrations.

Mr. John McIvor, who received the BEM in the 1956 New Year Honours List, has retired after 33 years' service with Billingham Division. He was a works councillor for 19 years and for a number of years a member of Billingham UDC.

Maurice James, a 19-year-old apprentice fitter at Billingham, has been awarded a technical state scholarship (one of only 250 awarded throughout the country) on the results of his Ordinary National Certificate examination in mechanical engineering, which he passed with distinction in July.

Miss Joan Hulse (Alkali Division) came close to winning the Cheshire Ladies' Archery Championship. She tied on points for first place with Miss Margaret Jones (Wirral Archers), who won the title because she had recorded eight more shots than the Winnington archer. Miss Hulse was awarded a silver medal as runner-up.

It is announced with deep regret that **Mr. J. H. W. Miller**, a former director of Scottish Agricultural Industries Ltd. who retired in 1955, died on 9th September.

Mrs. Pamela Carlyle (Dyestuffs Division), on holiday at Butlin's Holiday Camp at Pwllheli, North Wales, won both the Mother and Child competition with her daughter Christine, and the first award in the Holiday Princess competition. The latter entitles her to a free week's holiday and a place in the area finals.



Mr. and Mrs. Smith (see 70th Anniversary)

member of Wilton's Adult Association for Youth Activities, told the Field Marshal about the Youth Centre experiment, and Lord Slim showed great interest in the project. Now he has written offering the trophy, which can be awarded in any way the Youth Centre Committee care to choose. They have decided to award it annually to the most outstanding member of the year.

It is now just over a year since Wilton Council made its offer of financial assistance and premises for the establishment of a mixed open youth centre, which was to draw at least 30% of its members under 21 from outside ICI and which was to be run entirely by its own committee.

So far the main activity of the centre has been to put its house—several

derelict huts at Dormanstown—in order. This has been greatly helped by the Company's financial contribution and by voluntary assistance. It has been uphill work by a hard core of enthusiasts aided by adult supporters, who together have slowly turned the derelict buildings into a useful operational headquarters.

70th Anniversary

METALS Division's oldest pensioner, Mr. A. W. Smith, belies his 94 years by his sprightly manner, his excellent hearing, and his quick and amusing repartee. At the annual pensioners' dinner in January he won second prize in a "talent-spotting competition" with a gay little song, and he keeps his voice in good training

by singing hymns to his wife and daughter at home. He retired in 1932 after long service as a patternmaker.

He and his wife celebrated their 70th wedding anniversary on 3rd September and received a congratulatory telegram from the Queen. They both attended chapel on "the day" and afterwards celebrated at a family gathering.

APPOINTMENTS

Some recent appointments in ICI are: **Billingham Division:** Mr. W. d'Leny, Chairman; Mr. A. I. Johnstone, Resident Engineer (Billingham Project) at Severn-side Works; Dr. A. Walton, Mossend Works Manager. **Dyestuffs Division:** Mr. E. Butterworth, Assistant Chief Engineer; Dr. A. Lambert, an Associate Research Manager; Dr. A. Munn, Medical Officer; Mr. F. North, Chief Colourist. **European Council:** Mr. G. M. Power, head of Technical Department. **Fibres Division:** Mr. C. N. Harries, Commercial Director (Overseas); Mr. D. N. Marvin, Commercial Director (Home); Mr. A. R. Milne, Managing Director (jointly with Dr. E. B. Abbot and Dr. F. J. Siddle). **Head Office:** Mr. J. P. Wapenaar, Technical Liaison Officer for A.E. & C.I. in London. **Magadi Soda Co.:** Mr. G. S. Roberts, Chairman (in addition to Managing Director).

RETIREMENTS

Billingham Division: Mr. J. Black, Mossend Work Manager (retiring 31st December). **Fibres Division:** Dr. F. J. Siddle, a Joint Managing Director (retiring 31st December).

50 YEARS' SERVICE

The following employees have completed 50 years with the Company: **Alkali Division:** Mr. T. Clarke, Winnington Works (19th September); Mr. C. A. Tomlinson, Winnington Works (20th September). **General Chemicals Division:** Mr. W. H. Abram, Castner-Kellner Works (5th September); Mr. W. Gallagher, Oldbury Works (21st September).

ICI AND THE NUCLEAR AGE (continued from page 333)

practically all Britain's nuclear reactors; they have supplied aluminium pipework worth £100,000 to the nuclear research centre at Mol, Belgium. Spectacular even by Marston standards is a recent order for the huge laminated plastic vacuum vessels needed for the new proton synchrotron Nimrod—the most advanced equipment yet devised in Britain for research into atomic nuclei.

Millions of square feet of membranes, thousands of fuel cans, hundreds of miles of pipes and pipework, five completely new metals—these are among the more obvious of Metals Division's achievements in the field of nuclear engineering. Such a "scoreboard" takes no account of

invaluable but intangible technical contributions, of infinitely painstaking research routines, of all those small masterpieces of precision engineering which, in the interests of national security, must inevitably remain anonymous.

One thing is certain. No list of contributions to nuclear engineering, tangible or intangible, can as yet be complete. This is not only a young but an evolving industry; its demands on technologists and suppliers will be subject to constant growth and constant change until that unforeseeable day when man has solved all the riddles of the atomic universe.

October IN THE GARDEN

STORING AND CLEARING UP

By PERCY THROWER

THIS is the month to complete the storing away of fruit and vegetables and to ensure that crops left in the garden to be gathered as required continue to grow for as long as possible.

The gathering of apples and pears must be finished this month or many will be lost. Long keeping apples, I consider, are the better for being wrapped individually in soft white paper and stored in single layers in tomato trays. Best varieties for wrapping like this are Bramley's Seedling and Newton Wonder. A watchful eye must be kept on the pears which were gathered and put away earlier. Many of the best varieties will ripen fast this month and early in November and, as we well know, they very quickly go sleepy and are unfit for eating. Pears must be eaten as they ripen; it has been said that you have to stay up all night to get them just right.

POTATOES must be lifted now without delay and these will need very careful watching while in store. If the blight affected the tops it is bound to affect a lot of the tubers. Affected tubers—those with brown and black markings deep into the flesh—must be sorted out from the sound ones, which would otherwise also become diseased.

The crops remaining in the garden include brussels sprouts, heading broccoli, purple sprouting broccoli, cabbage (Savoy and January King), leeks, celery and parsnips. Many of these, I think, will be sweeter and better when they have had a good frost on them. The yellowing leaves of the brussels sprouts—usually those nearest the

ground—should be cleared away, but care must be taken not to damage the healthy leaves. Some of the older leaves of the cabbages may also begin to yellow and should be cleared away from the plants.

The final earthing-up of celery should be done, and if folded newspaper is loosely wrapped round the sticks before pulling up the soil, it will help to keep them cleaner. A little soil pulled up along each side of the leek rows will ensure a longer white stem. These vegetables come into their own during February and March when other vegetables are usually scarce and expensive.

WE shall see this month the autumn tints; so shall we also see the leaves beginning to fall. This means the continual task of clearing and raking up the leaves which must not be left to lie thick on the lawn or on the alpine and other small plants. These leaves with the waste from the vegetable garden and the annuals and other summer flowering plants which we shall be clearing away, must be made into garden compost. As every gardener knows, the soil can only be kept in good heart by continual replacement of humus. In these days of shortage of animal manure, garden compost is the finest substitute and it is up to every gardener to make all he can.

As I have already said, the summer flowering plants, which have done so well, must be cleared away to make way for those we wish to have flowering in the spring. The dahlia tops must be cut off after tying a label to the stem of each just above ground level. They can

be left until the frost blackens the tops, but in many seasons if we do this it makes us late with the planting of wallflowers, polyanthus, forget-me-nots and bulbs, etc. The tubers of the dahlias can be lifted and dried and stored away but make sure the stems are thoroughly dry before putting them away, otherwise fungus may begin on the stems and then affect both buds and tubers. Once thoroughly dry, the roots can be wrapped in newspaper or packed into boxes with straw all round and they must be put safely away where frost will not harm them. If you should be in doubt as to whether the stems are dry enough, dust them over with yellow flowers of sulphur before putting them away.

GLADIOLI, too, must be lifted and put safely away. It is, I think, best to leave the tops on these, tie them into bundles and hang them up in a cool airy place. Once the stems are thoroughly dry the corms can easily be separated and they will take up very little room in store.

At the moment we are busy planting in readiness for the spring, and the spring flowers are, I think, the brightest of them all. The beds and borders must be cleared and dug over to the depth of the fork or spade. Some all-purpose fertilizer, a handful for each square yard, can be mixed with the soil as digging is done. This will help to get the plants established and some will remain for when growth begins in the spring. The soil must then be firmed and made even and the plants well spaced out; firm planting is essential at this season of the year.

NEWS IN PICTURES

Home and Overseas



The jackpot. These lucky members of Metals Division's Engineering Drawing Office formed a syndicate which recently netted a cool £10,564 on the football pools. The syndicate has been in operation for a year or two, but this is the first major return on their outlay. They, and their colleagues who were invited to join in the celebrations, hope it may be the first of many



One of their biggest. This impressive picture was taken in the foundry at Billingham when a Y-piece generator base was being cast. The ladle, containing 3000 lb. of molten metal, is operated by Mr. A. Phillips, a moulder, who is turning the wheel which tips it gradually over, allowing the metal to flow evenly into the mould. A second man makes use of the white-hot metal to light a paper "taper" which he uses to run round the sides of the mould casing, igniting any escaping gases to prevent pollution of the air



Unscheduled landing. On the way across Ardeer factory from the River Garnock, a low-flying swan tangled with overhead wires and was forced to make an unscheduled landing. Since it was apparently unable to take flight again, it was taken into protective custody by Mr. James Johnstone, who later released it at the wharf, when it swam away apparently fully recovered



Endeavour essay awards. Sir Wilfrid Le Gros Clark, president of the British Association, presents the first prize in the *Endeavour* essay competition to Mr. B. L. Roberts. Also in the picture (*left to right*) are Dame Kathleen Lonsdale and Dr. W. E. Swinton, general secretaries of the British Association, and Sir George Allen, secretary. The ceremony took place during the BA meeting at Norwich last month



Nigerian Office's farewell. Mr. N. Sykes (*seated 5th from left*) with the staff of the Nigerian branch of ICI (Export) at his farewell presentation ceremony. Mr. Sykes retired as assistant general manager of the West African branch on 5th September after 30 years with ICI. His gifts were a silver cigarette case and, from the Company drivers, a group photograph of themselves with Mr. Sykes



Transporting butadiene. After more than a year's successful experience of transporting butadiene—used in synthetic rubber production—in the special tankers for liquefied petroleum gases owned by A/S Kosangas of Copenhagen, Heavy Organic Chemicals Division is now using the latest and largest vessel of the fleet—the 800-ton *Lili T. Alstrup*, which is capable of refrigerating her own cargo. She is seen in the photograph at West Hartlepool



Secretary's success. Miss Kathleen Keenan, secretary to one of General Chemicals Division's assistant chief engineers, recently obtained her private secretary's diploma. She is the first person in the Division to get this new high-level qualification—only 46 diplomas were awarded throughout the country



Down on the farm. The background of this picturesque rural scene is Wilton Works, in North Yorkshire. ICI's operations at Wilton involve the direct farming of some 1000 acres. Seen cutting and threshing oats—part of the 300 acres under cereal crops—are Clifford Harling (*driving*) and Kenneth Pearson. In spite of the poor weather, the overall crop standard is reported to be a good average



Picked for Tees-side's team. Mr. Harry Collett, a welder at Billingham, ran the 5000 metres in an athletics match between Middlesbrough and Oxelosund, Sweden, held in Sweden on 25th August. There is a connection between the two towns through the steel industry. *Above:* Mr. Collett on a training run at Billingham



Cooks qualify. Two Wilton Works assistant cooks, Susan Coates (*left*) and Gillian Pearson, both aged 17, have passed City and Guilds catering examinations, which equip them with practical and theoretical knowledge to work in kitchens of leading hotels. Gillian has decided to make her career in industrial catering, which she considers offers greater opportunities of promotion for women. Susan, who is fond of making fancy sweets—everything from soufflés to Bavarois—hopes one day to become an air hostess



Gold awards. Mr. Gordon Bagnall (*left*), who is on the laboratory staff at General Chemicals Division's Pilkington-Sullivan Works, and Mr. Norman Winder, an apprentice at Billingham Division's Trimpell Works at Heysham, have both gained the gold standard of the Duke of Edinburgh's Award. They are the first employees in their respective Divisions to qualify



Safe driving award. Mr. J. C. A. Chivers (*left*), works manager of Dyestuffs Division's Huddersfield Works, congratulates Mr. J. Green on being awarded his 23-year bar to his safe driving medallion



Record year. The gardening section at Alkali Division's Winnington Works recorded their greatest success ever at Shrewsbury Flower Show, when each of their four entries collected prizes and they won the William Adams Gold Perpetual Challenge Trophy and the Viscountess Boyne Perpetual Challenge Trophy, the latter for the fifth year running. *Above:* Mr. G. S. Couper, general services manager at Winnington, congratulates Mr. W. Dale, foreman gardener. Others (*left to right*) are Messrs. Bostock, Williamson, Hulme and Donkin

Growing up with golf

By Denzil Batchelor

Ten years ago in Britain few youngsters played golf. To-day there are 500 schools—public, private and state-owned—where 12,000 boys and girls are learning to play what was once considered a game only for grown men. This increasing interest in golf is, according to Denzil Batchelor, the direct result of the activities of the Golf Foundation.

NOWADAYS, you have got to catch them young and treat them gently. Not everybody understood from the first that if you wanted to make the young entry into golfers you had to catch them young. Though one of the most famous pictures in sporting history is the eighteenth-century portrait of two golfing children—the first Lord Macdonald of the Isles and his brother—there were many who considered that golf was a grown man's game; could be an old man's game; but never a youth's. The Boys' Amateur Championship was first held in 1921 and it was not until after World War II that it was played for on the Old Course at St Andrews under the aegis of the Royal and Ancient Club. "Golf," as an old champion once said to me, "is for fathers and grand-fathers to play; for children to *play at*."

Mark you, there were those who sought to shake this lapidary conviction, blocking the way to progress. Way back in 1916, a fourteen-year-old who lived just

off the thirteenth fairway at Atlanta's East Lake course found himself playing Eben Byers, a sometime American Amateur Champion, in the first round for the Amateur title at Philadelphia's Merrion Club. The youngster was so furious at not winning every hole that he threw away club after club as he progressed. So did the choleric Byers. The youngster won 3 and 1, "because Byers ran out of clubs first," as the victor (whose name was Bobby Jones) later explained. But even at that age and on that performance, Jones wasn't taken seriously by grown-ups. Alex Smith, a one-time American Open champion, said, "He'll never make a golfer. Too much temper." Moreover the poor kid was untutored. The nearest he'd ever got to instruction was eavesdropping when the club professional, Stewart Maiden, gave someone else a lesson.

Well, it was to remedy just those handicaps that the young Jones started under, that the Golf Foundation



Night school at St. Andrews. Youngsters between the ages of 15 and 18 are shown the technique of the game at a class sponsored by Fife County Council Education Committee

first came into being in 1952. Four men thought of it—apparently simultaneously. They were Cyril Gray, Raymond Oppenheimer, Henry Cotton and Jack Burroughs. Their plan was to promote golf in boys' and girls' schools of every type throughout Britain.

To test out their scheme they began with six schools: Beaumont, Fettes, Malvern, Rugby, Stowe and Wellington. It will be noticed that these were all Public Schools, but it must be re-emphasised that they hoped to make the game available to boys and girls at every type of school, public, private and state-owned. Throughout 1952, teaching and an introductory lecture and demonstration by Henry Cotton evoked an immediate enthusiasm in the Six. Wellington found room for practice on its own playing-fields; pupils from the other schools were taught on local courses.

Girls' schools were quick to take up the new idea when given the chance a year later. Some say that Effingham House, Bexhill, was the pioneer of feminism in this direction.

By 1953 the Golf Foundation had made sufficient progress to have itself registered as a non-profit-making company. In the Easter term of that year there were twenty-five classes in operation; by mid-summer 108 Universities and schools (from prep to public, grammar and secondary modern) had accepted the scheme. Since then the programme has snowballed. There are today some 500 schools taking part—representing a grand total of 12,000 boys and girls playing golf where hardly any had played under proper instruction ten years ago.

How does the scheme work? What does it cost to take part in it? What do you get for your money?



Girls of St. Anne's-on-Sea learn the correct grip on a golf club. St. Anne's College was one of the first girls' schools to take up golf under the Golf Foundation scheme

Well, it can cost nothing—but in a Britain that never had it so good, it shouldn't. A donation of five shillings per head per term, made either by the school or by the pupils, is enough to separate those who are keen to learn from those who are merely keen to get something for nothing. The Foundation has no stock of clubs or balls available for classes; the professional who teaches generally manages to raise what is needed from members of his club for a start to be made.

Here it should be emphasised that the whole success of the scheme has been dependent from the first on the co-operation of members of the Professional Golfers Association, who give instruction for a fee of £1 an hour to a maximum of £2 a visit, and who a short time ago cheerfully accepted a cut in these rates,

which has only recently been restored. Classes vary from ten to eighteen pupils, and ideally there should be eight to ten lessons during the summer followed by a similar number in the Christmas and Easter terms. There are holiday classes too, six or eight hourly periods of instruction available to juniors under the age of eighteen at a cost of five shillings a head for each pupil.

The part played by the Central Council of Physical Recreation cannot be overlooked. Acting in close co-operation with the Foundation, the CCPR last season laid on instructional courses for 3837 pupils at 212 centres.

Then there are the Holiday Competitions for Juniors organised at seaside resorts—the *Daily Telegraph* presented prizes to a hundred winners in 1960.

There is also the promotion—this time for the third year—of the London Schools Tournament; and the laying on, a short while ago, of matches between British girls and teams representing Canada and South Africa, and Australia and New Zealand. Nor must we forget the publication of manuals and the showing of



coaching films freely lent by Messrs. Slazengers and Spaldings.

Not surprisingly, so much activity has already precipitated occasional outstanding players. The Foundation gained its first professional success as long ago as 1958 when Tony Grubb, a product of its coaching, having been introduced to the game through classes attended while at Malvern, won the Assistants' Competition. At this time three other Foundation "Old Boys" were holding jobs as Assistant Professionals.

In the same year James Grant, a Foundation pupil first coached by Tom Ainslie of Inverness, won the Scottish Boys' Championship, and in 1959 Alan Murphy, of Daniel Stewarts College, a pupil of D. Houston at Braid Hills, won the Boys' Championship. Last year G. A. Caygill, Assistant at Sunningdale, who learned the game in Foundation classes at Carlisle City Golf Club, won the British Youths' Open Championship.

Well, that is a rapid assessment of the achievements of the plan first tentatively put into action nine years ago. How good a job the Foundation has done can be

gauged from the fact that Australia and New Zealand set about following its example some three years ago, while the South African authorities are in England this year anxious to follow suit. The Foundation's credit side shows tens of thousands of boys and girls initiated into a sport to which, without its help, they would probably never have got closer than the television screen at the time of the Open. Against this, the Foundation shows at the time of writing an excess of expenditure over income of a little more than £2000.

Yes, from their founders' point of view, the Foundation has done a good job. How does it look from the point of view of the pupil?

"If you ask me," says Sid —, from a County Secondary school, "It's done a job and a half. Look at it my way—what do I care about team spirit, see? What I'm after is self-expression, mister, and I don't want no flannel about fighting till I drop for the sake of the dear old school. The school isn't dear—I hate its guts. It isn't old; it's newer than the betting shop on the corner. But golf—well I found I liked to play, to beat the other guy. Then again, it didn't do no harm, no harm at all, to be a dab at it when I left school and went out into business. Right from the start, I believed it was a game for the toffee-nosed top people. But for once I was wrong, believe it or not. The Foundation taught me I could buy my clubs on the old h.p.—I began with four, and they're all unbreakable, so I'll be using them when I'm on the old age pension.

"And joining a club? Well, at under eighteen they welcomed me at a guinea a year—even the posh ones at the other end of the town are only three. And, mister, if you knew what I was knocking over when I was seventeen you'd have a fit—you and the Chancellor of the Exchequer. . . ."

It's only a matter of the vernacular. The young man who didn't enjoy Rugby at Wellington or Soccer at Malvern way back in '52 probably has substantially the same gratitude to express as Sid.

For the curious thing about life is that we change, but golf doesn't. In the course of time, when Sid — earns his knighthood and bores the life out of the boys at the County Secondary school with his prize-day speech emphasising the glories of team spirit, he will still have at heart the ambition of sixty years back in the days when he first had instruction under the professional provided by the Foundation. It's perfectly true, he hasn't yet done a hole in one—but one of these days. . . .

The truth about the Pygmies

David Lessels, working his way across Africa from bottom to top, describes an exciting time hunting with these tiny men of the Congo. Pygmies have been a fruitful source of travellers' tales, some true, some false. Recently, to keep up the myth that pygmies build liana suspension bridges, a TV company had the big Africans teach the pygmies how to do it and then photographed the fraud!



The pygmies were ready for the hunt. The morning mist was lifting from the dripping trees that were bearded with lichen and festooned with liana creepers. The men shouldered the coiled fibre nets and grasped their bows and poisoned arrows. The women swung wicker baskets on their backs to carry the meat, placing the carrying straps round their foreheads, creel fashion; in the string that supported their bark-cloth aprons they carried spearheads with sharpened edges for fleshing and carving.

How small they looked! How incredible to think that they were going to hunt where they might meet some of the world's largest and most ferocious animals! They looked more like children playing a game than adults going about the serious business of providing food for themselves and their families. Their miniature weapons—the arrows no bigger than knitting needles—looked like toys and emphasised the deception. Standing beside them I felt like a giant. Indeed, these past few weeks with them had been like living a chapter of Gulliver's Travels. Here in this Congo forest was Lilliput in reality.

Africa has often been described as the land of contrasts, and nowhere else does it provide such contrasts as in the eastern Congo and in Ruandi-Urundi. Here beside the pygmies dwell the 7 ft. tall Watusi. Here too, by the Epulu river, where the animals are more ferocious than anywhere else in Africa, is the one place in the world where African elephants are tamed and trained for work.

But, while the Watusi have been only recently "discovered"



The author with pygmies ready for a hunt. (Photograph taken by automatic release)

and trained African elephants almost unheard of, the pygmies have been meat for travellers' tales ever since travellers have been going to Africa. They were known to the ancient Egyptians and were depicted in carvings in the tombs of the Pharaohs. But, as so often happens with travellers' tales, many inaccuracies have been spread regarding these little people.

I had come to the Ituri forest believing that the pygmies were mysterious people who lived in the heart of dense jungle and were rarely seen. I had been told that they built liana suspension bridges over rivers and that they dug pits to trap animals and killed elephants by dropping heavily weighted spears on them. I found that none of this was true, all such feats of engineering being the work of the big Africans.

An example of how wrong impressions are spread was shown when a few years ago a famous television team went to photograph the pygmies building a liana bridge. When they found that the pygmies do not make bridges, and in order not to disappoint their public, they had the big Africans teach a group of pygmies how it was done and photographed the fraud.

The pygmies do live in the heart of a great forest, but when I was there the colonising Belgians had cut a road through the middle of that forest and, to streamline their administration, they made all Africans live near it. All pygmies are slaves to the larger Africans, and although they roam the forest at will they stay within a few days' radius and report back to their masters at frequent intervals.

The slavery seems to be voluntary, the pygmies supplying meat to their masters in return for bananas, plantains, yams, cooking pots, and other produce of the more settled mode of life led by the big or "real" people, as the pygmies refer to them. Nevertheless, a pygmy must obtain permission from his master before he can marry.

Unlike most African tribes, the pygmies practise monogamy and have a fairly high moral code. They have no language of their own and speak that of the Africans to whom they belong. Legend has it that at one time there was a pygmy language, and every so often someone claims they have found the lost language. But to date all such claims have been refuted.

But now the hunt was ready to start. We left the cluster of little huts and filed off down a path in the forest. We had barely gone a hundred yards when we came on a man sitting beside a fire. Although they had just left the fire at the camp the hunters stopped and squatted beside this blaze for a few minutes to chat and laugh. This practice of lighting a fire only a short distance from the camp just before the main party left was a ritual with every hunt for which I could never find an explanation. What superstition lay behind it? Was it a fetish to ward off Esamba—Esamba, the evil spirit, which meant death to anyone who saw it?

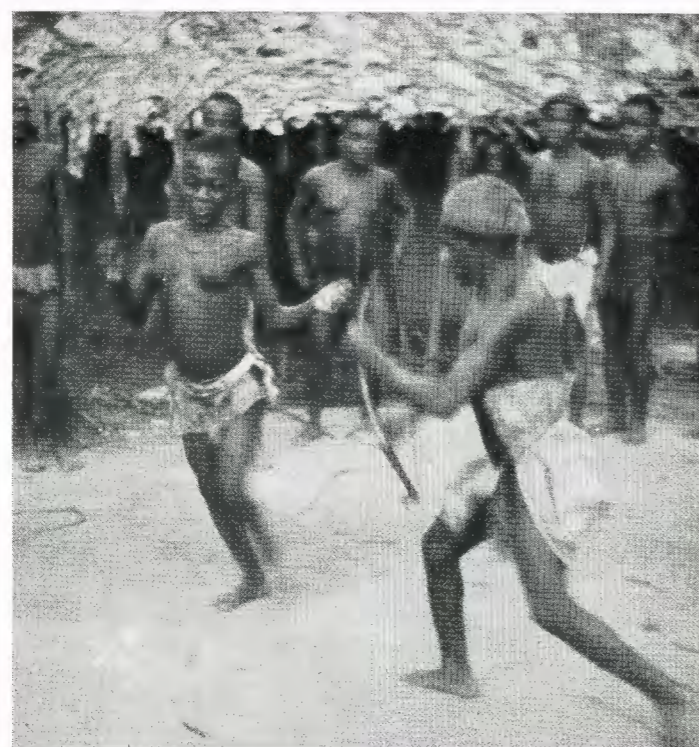
Presently Faizi the leader rose, crooked his left arm into his side and slapped the hollow thus made with his right palm, making a sound like clapping with cupped hands, but louder. He led the way into the bush. A woman picked up two burning



Pygmies with the author. The girl on the left carries strapped to her head a basket for bringing back meat; the spearhead strapped to her thigh has been sharpened for use as a knife



Pygmy woman smoking a pipe made from a banana leaf stem



Pygmies dance after the hunt

brands from the fire and took them with her. Since the pygmies cannot make fire it was this woman's job to keep the sticks alight all day, which she did by holding them together or swinging them to and fro so that there would be fire for warmth and protection should by accident we be benighted away from camp.

Off the path the jungle is as dense as coconut matting. The trees grow close together, and from the branches dangle liana vines which are laced into a mesh at ground level by thorny creepers that tear at clothing and skin. While I struggle along as if caught up in a never-ending spider's web the pygmies move with ease. They are silent too. There are over a dozen in the party, yet, except for my blundering, scarcely a sound is heard. When I get caught up in snags they melt away, and by the time I have freed myself there is not even a snapping twig to guide me. Then like a wraith one appears by my side smiling patronisingly to lead me on.

Language without Words

No one speaks. All communications are made with special whistles, calls and clapping. This hunting language is effective; the people back at the village always know if we have caught anything, and if so which kind of animals, before we get there.

When they decide to cast the nets they play them out at an incredible speed, never getting them tangled up. There are four nets, each about a hundred yards long and four feet high. One man is left to hook them up to the trees while the others circle round to beat the game into the trap. By the time the last few feet are being hitched up the beaters have started hooting and catcalling.

Sitting behind a tree beside the net I wonder what, if anything, will fall into the bag—antelope, wild pig, buffalo, leopard . . . perhaps even a rare okapi, the antelope with the giraffe-like neck and zebra stripes, whose existence when referred to by natives was scoffed at by white men until one was killed some years ago. The forest buffalo is smaller and even more cunning and aggressive than the plains type, and will not only charge if met but stop to gore and trample. Its horns, unlike those of plains buffalo, are straight and sharp.

How tall the trees are—how solid the roof the knitted branches form! High up in the fan-tracery a family of monkeys swings away from the approaching din. As the shouting and threshing draw nearer the tension mounts. Moisture dripping from the trees drums louder and louder on fiddle-string nerves.

It rained last night. How it rained! Great sheets of solid water that came with a roar so that a shout was barely audible. Yet the little beehive-shaped huts made of leaves piled shingle fashion on frames of criss-cross sticks, which the pygmies throw up in an hour or so, kept one almost dry. But what the rain misses the humidity finds when the sun rises. Dampness finds its way into everything, spreading mildew, rotting clothes and boots. Here sugar is always in a lump, salt never pours.

It is hot and sticky. The tattoo of raindrops quickens in tempo. Louder. Louder. The beaters are almost on us. Anything lying doggo must break now.

Anticlimax! The beaters arrive and nothing is in the nets. Nerves twang loose and legs jelly momentarily with the aftermath. Roll up the nets and claw a way through the barbed entanglement to another pitch. Hook up the nets. Wait. Anticlimax again. And again and again. Then success.

A little grey antelope is caught in the net. Its squealing slips

an octave, then fades away pitifully as my pygmy companion stabs it with his spear.

On to the next pitch, and more success. Two antelopes this time. And at the next stretch another one and, to round off, a juicy pig. Each time the animals are skinned and cut up at an astonishing speed, sometimes even before I have groped my way to the scene.

The hunt over, the women bent with laden baskets, the pygmies sang and capered their way home. There was no need for silence now. As we went Faizi showed off his jungle to me as a gardener would his garden. That plant was good to eat, this one was poison. If you dug up this bush the roots were succulent, but that one was bitter.

Suddenly a man shouted and pointed to a beehive high up in a tree. The fire carrier handed the man one of her sticks. He shinned up the tree with it and stuck it in the nest. He wore no protective clothing and yet he did not appear to be stung. When the bees were gone the man tore off great lumps of honeycomb and threw them down to the people below. There is nothing more refreshing than fresh honey on the comb when you have had a hard day.

Back at the village when the meat was divided up there was time to rest. A 6 ft. long pipe, made from a hollowed banana leaf stem, was lit and passed round. Everybody, men, women and children, took a few puffs and handed it on. I had a feeling it was not tobacco, but *bang*—Indian hemp—that burned in the bowl. The plant from which it is made grows wild in the forest.

Faizi sat on a stool made with three sticks lashed together with bark thongs and told me how he had killed an elephant. He spoke Kingwana, which was near enough to Swahili for me to get the gist of the story. The other pygmies gathered round to listen, though they must have heard the tale many, many times. In Africa story-telling is an institution. By it folklore and history are handed down. It is heady entertainment, and a good story-teller is always sure of an audience no matter how hackneyed his tales.

No Mean Raconteur

Faizi was no mean raconteur. With actions and dramatic pauses he carried his listeners with him, and before long they were clicking their tongues and shaking their heads in acknowledgment of his deeds as if it were all new to them.

Faizi, eager to prove his bravery and his skill as a hunter, had tracked the elephants alone. When the time was ripe, using the wind astutely, he had crawled right up to one and run under its belly, stabbing it in the bladder with his spear on the way through. He had followed it for two days until it died.

The story finished, the dancing started. They formed a circle and pranced round in time to impromptu songs and clapping. The singing had charm, the dancing a rhythm of abandon that epitomised the pygmies' attitude to life. All ages joined in, young men still clutching their bows and arrows, maidens revelling in the spells they cast with their flashing bodies, old crones with puckered faces and leathery breasts flapping, and elders who tried to inject some dignity into the fandango.

On and on they danced, whirling and stamping. Far away the drums of the "real" people talked. The night closed in, and with it the rain. The dancing ceased, the drums fell silent. Above the swish of the rain a bush-baby cried pitifully. This was Africa.

